

## High voltage fast-switching NPN power transistor

### Features

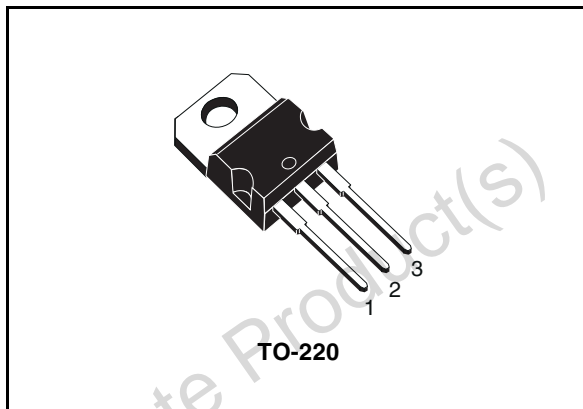
- High voltage capability
- Low spread of dynamic parameters
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed

### Applications

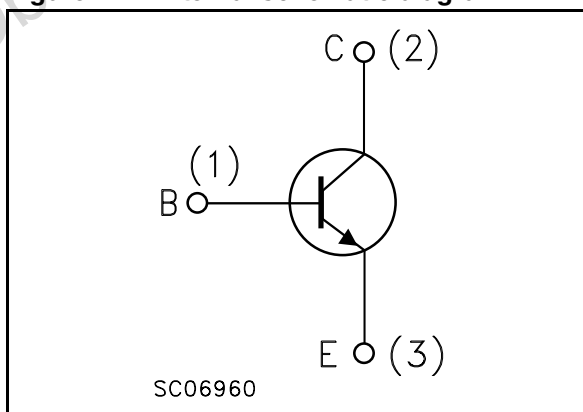
- Electronic ballast for fluorescent lighting
- Electronic transformer for halogen lamps

### Description

The device is manufactured using high voltage Multi Epitaxial Planar technology for high switching speeds. It uses a cellular emitter structure with planar edge termination to enhance switching speeds while maintaining a satisfactory RBSOA.



**Figure 1. Internal schematic diagram**



**Table 1. Device summary**

Oder code	Marking	Package	Packaging
TR236	TR236	TO-220	Tube

# 1 Electrical ratings

**Table 2. Absolute maximum rating**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{BE} = 0$ )	700	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	400	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ , $I_B = 2$ A, $t_p < 10$ $\mu$ s)	$V_{(BR)EBO}$	V
$I_C$	Collector current ( $I_C = 0$ )	4	A
$I_{CM}$	Collector peak current ( $t_p < 5$ ms)	8	A
$I_B$	Base current	2	A
$I_{BM}$	Base peak current ( $t_p < 5$ ms)	4	A
$P_{tot}$	Total dissipation at $T_c \leq 25$ °C	70	W
$T_{stg}$	Storage temperature	-65 to 150	°C
$T_J$	Max. operating junction temperature	150	°C

## 2 Electrical characteristics

( $T_{\text{case}} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

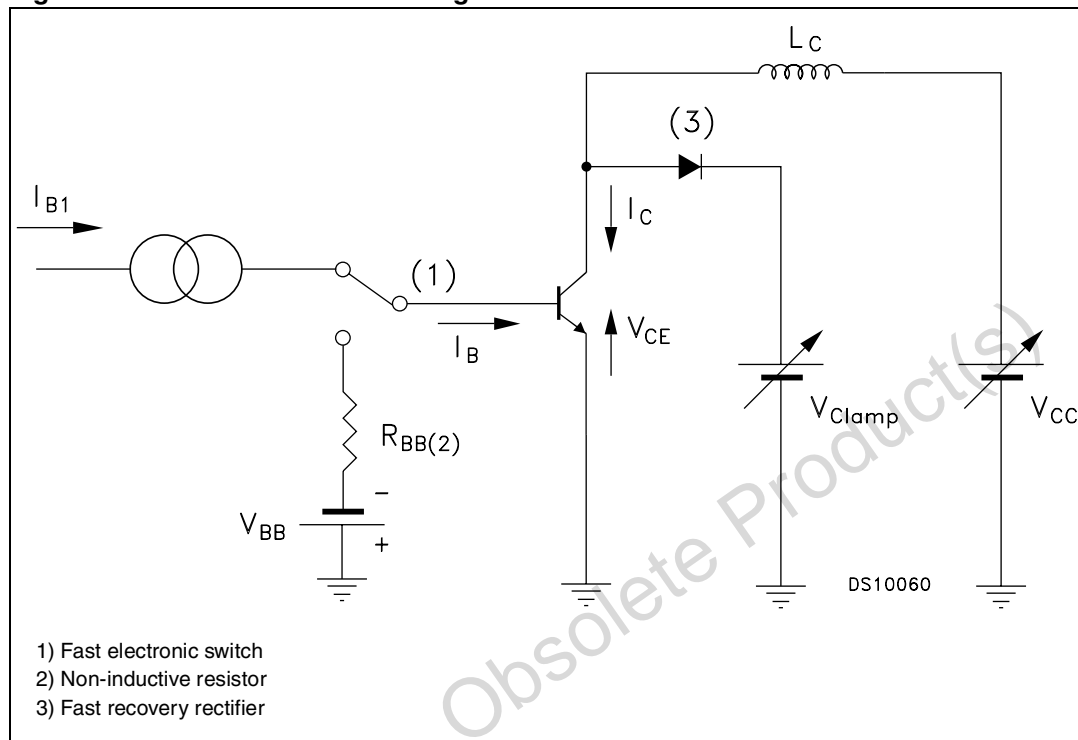
**Table 3. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CES}}$	Collector cut-off current ( $V_{\text{BE}} = 0$ )	$V_{\text{CE}} = 700\text{ V}$ $V_{\text{CE}} = 700\text{ V}$ $T_{\text{C}} = 125\text{ }^{\circ}\text{C}$			0.1 0.5	mA mA
$I_{\text{CEO}}$	Collector cut-off current ( $I_{\text{B}} = 0$ )	$V_{\text{CE}} = 400\text{ V}$			0.25	mA
$V_{(\text{BR})\text{EBO}}$	Emitter-base breakdown voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = 10\text{ mA}$	9		18	V
$V_{\text{CEO(sus)}}^{(1)}$	Collector-emitter sustaining voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 10\text{ mA}$	400			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 0.8\text{ A}$ $I_{\text{B}} = 0.1\text{ A}$ $I_{\text{C}} = 2.5\text{ A}$ $I_{\text{B}} = 0.6\text{ A}$			1.1 1.3	V V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 1\text{ A}$ $I_{\text{B}} = 0.2\text{ A}$ $I_{\text{C}} = 2.5\text{ A}$ $I_{\text{B}} = 0.5\text{ A}$			1.2 1.3	V V
$h_{\text{FE}}$	DC current gain	$I_{\text{C}} = 10\text{ mA}$ $V_{\text{CE}} = 5\text{ V}$ $I_{\text{C}} = 2.5\text{ A}$ $V_{\text{CE}} = 5\text{ V}$	10 8		28	
$t_{\text{s}}$ $t_{\text{f}}$	Inductive load Storage time Fall time	$V_{\text{CC}} = 200\text{ V}$ $I_{\text{C}} = 2\text{ A}$ $I_{\text{B1}} = 0.4\text{ A}$ $V_{\text{BE(off)}} = -5\text{ V}$ $R_{\text{BB}} = 0\text{ }\Omega$ $L = 200\text{ }\mu\text{H}$ (see <a href="#">Figure 2</a> )		0.6 0.1		$\mu\text{s}$ $\mu\text{s}$

1. Pulsed duration = 300ms, duty cycle  $\leq 1.5\%$

## 2.1 Test circuits

Figure 2. Inductive load switching test circuit



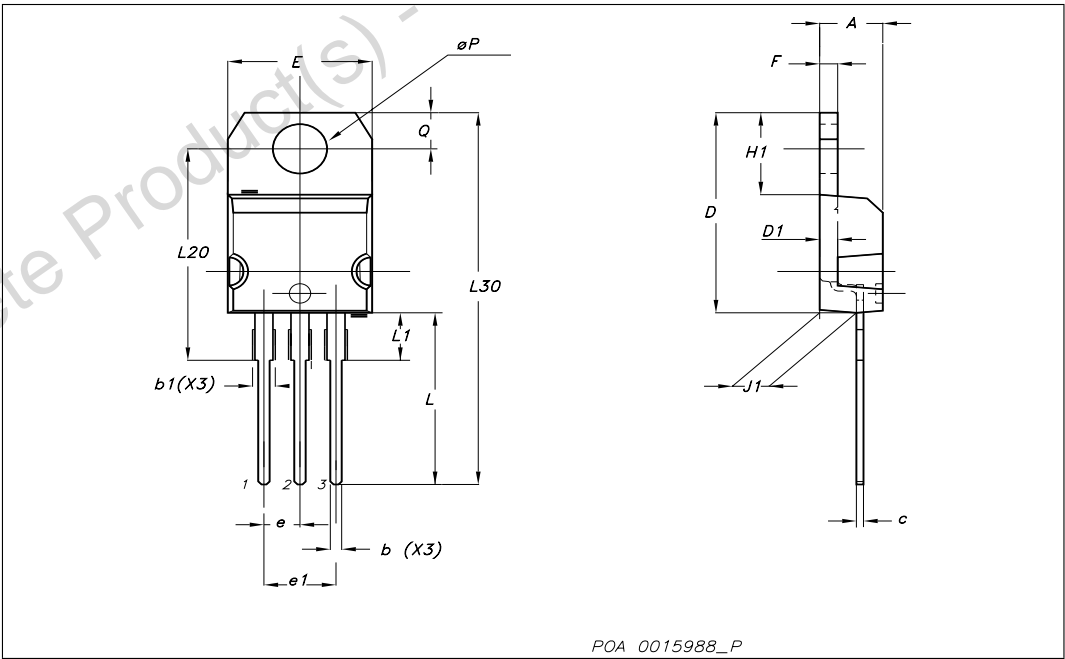
### 3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: [www.st.com](http://www.st.com)

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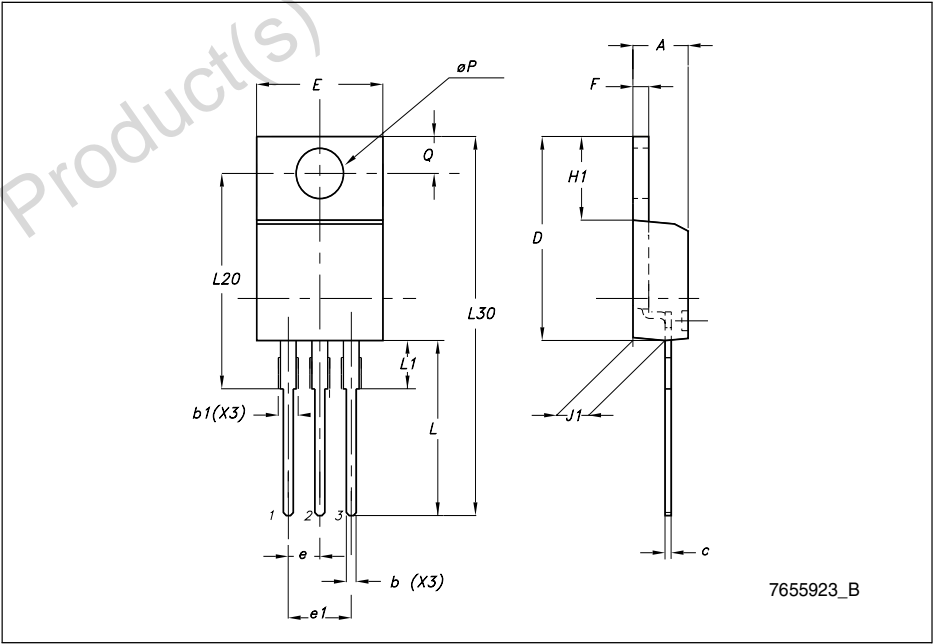
TO-220 mechanical data

Dim	mm			inch		
	Min	Typ	Max	Min	Typ	Max
A	4.40		4.60	0.173		0.181
b	0.61		0.88	0.024		0.034
b1	1.14		1.70	0.044		0.066
c	0.49		0.70	0.019		0.027
D	15.25		15.75	0.6		0.62
D1		1.27			0.050	
E	10		10.40	0.393		0.409
e	2.40		2.70	0.094		0.106
e1	4.95		5.15	0.194		0.202
F	1.23		1.32	0.048		0.051
H1	6.20		6.60	0.244		0.256
J1	2.40		2.72	0.094		0.107
L	13		14	0.511		0.551
L1	3.50		3.93	0.137		0.154
L20		16.40			0.645	
L30		28.90			1.137	
ØP	3.75		3.85	0.147		0.151
Q	2.65		2.95	0.104		0.116



POA 0015988\_P

TO-220 type E mechanical data			
DIM.	mm.		
	MIN.	TYP	MAX.
A	4.47		4.67
b	0.70		0.91
b1	1.17		1.37
c	0.31		0.53
D	14.60		15.70
E	9.96		10.36
e		2.54	
e1	4.98	5.08	5.18
F	1.17		1.37
H1	6.10		6.80
J1	2.52		2.82
L	12.70		13.80
L1	3.20		3.96
L20	15.21		16.77
øP	3.73		3.94
Q	2.59		2.89



## 4 Revision history

**Table 4. Document revision history**

Date	Revision	Changes
08-Oct-2007	1	Initial release.
13-Feb-2008	2	Updated TO-220, type E, mechanical data



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